

CLAIMS

I claim:

- 5 1. A material dispense pump comprising:  
a pump body formed of thermally conductive material;  
a motor having an output axle;  
a pump cartridge formed of thermally conductive material, the pump cartridge  
having an auger screw driven by the output axle of the motor for dispensing material,  
10 the pump cartridge being in thermal communication with the pump body;  
a motor mount that mounts the motor to the pump body, the motor mount  
comprising a thermally insulating material that thermally insulates the motor from the  
pump body; and  
a pump body heater in thermal communication with the pump body for  
15 applying heat to the pump body and cartridge.
2. The material dispense pump of claim 1 wherein the cartridge comprises a material  
selected from the group consisting of aluminum, copper, aluminum alloy, copper alloy,  
and aluminum-copper alloy.
- 20 3. The material dispense pump of claim 1 wherein the cartridge comprises copper.
4. The material dispense pump of claim 1 further comprising an auger coupler that  
couples the motor axle to the auger screw, the auger coupler comprising thermally  
25 insulating material that thermally insulates the motor axle and auger screw.
5. The material dispense pump of claim 1 wherein the pump body heater comprises a  
heater and a temperature monitoring device and further comprising a pump body heater

controller for controlling the temperature of the pump body in response to a signal received from the temperature monitoring device.

- 5        6.        The material dispense pump of claim 5 wherein the pump body heater comprises a resistive heater and wherein the temperature monitoring device comprises a thermocouple.
- 10       7.        The material dispense pump of claim 5 wherein the pump body heater controller, the pump body heater, and the temperature monitoring device are configured as a closed loop heat control system for controlling the temperature of the pump body.
- 15       8.        The material dispense pump of claim 1 further comprising a pump body heater plate that abuts a surface of the pump body, the pump body heater plate comprising a thermally insulating material, wherein the pump body heater is seated at an outer surface the pump body heater plate to interface with the surface of the pump body.
- 20       9.        The material dispense pump of claim 8 wherein the pump body heater plate further comprises a compression mechanism that urges the pump body heater toward physical contact with the surface of the pump body.
- 25       10.       The material dispense pump of claim 8 further comprising a quick release mounting plate that mates with a latch plate for mounting the material dispense pump to a base, the quick release mounting plate being coupled to the pump body heater plate such that the quick release mounting plate is thermally insulated from the pump body.
11.       The material dispense pump of claim 1 further comprising cartridge retention screws that retain the pump cartridge in the pump body, an outer surface of the cartridge retention screws comprising thermally insulating material.

12. The material dispense pump of claim 1 further comprising a dispense tip retention nut for mounting a dispense tip to the pump cartridge, an outer surface of the dispense tip retention nut comprising thermally insulating material.

5 13. The material dispense pump of claim 1 wherein the thermally insulating material comprises Ultem™.

14. The material dispense pump of claim 1 wherein the motor comprises a closed-loop servo motor having indexed rotational positions.

10 15. The material dispense pump of claim 1 further comprising a material reservoir heater for heating material contained in a material reservoir to be dispensed by the pump cartridge.

15 16. The material dispense pump of claim 15 wherein the material reservoir heater comprises a heater and a temperature monitoring device and further comprising a material reservoir heater controller for controlling the temperature of the material in response to a signal received from the temperature monitoring device.

20 17. The material dispense pump of claim 16 wherein the material reservoir heater comprises a resistive heater and wherein the temperature monitoring device comprises a thermocouple.

25 18. The material dispense pump of claim 15 further comprising a heat distribution body comprising heat conductive material in thermal communication with the material reservoir heater that houses the material reservoir and heats material contained in the reservoir.

19. The material dispense pump of claim 18 wherein the material reservoir comprises a material syringe, and wherein the heat distribution body is cylindrical in shape.
20. The material dispense pump of claim 18 further comprising a reservoir support mount for supporting the heat distribution body and the material reservoir and wherein the reservoir support mount is formed of thermally insulating material that thermally insulates the heat distribution body from the pump body.
21. The material dispense pump of claim 15 wherein the material reservoir heater controller, the material reservoir heater, and the temperature monitoring device are configured as a closed loop heat control system for controlling the temperature of the material reservoir.
22. A material dispense pump comprising:
- a pump body formed of thermally conductive material;
  - a motor having an output axle;
  - a pump cartridge formed of thermally conductive material, the pump cartridge having an auger screw driven by the output axle of the motor for dispensing material, the pump cartridge being in thermal communication with the pump body;
  - a pump body heater in thermal communication with the pump body for applying heat to the pump body and cartridge; and
  - a material reservoir heater in thermal communication with a material reservoir containing material to be dispensed for applying heat to the material, wherein the material reservoir heater and pump body heater operate independently to control the temperature of the pump body and cartridge and the temperature of the material.

23. The material dispense pump of claim 22 further comprising a motor mount that mounts the motor to the pump body, the motor mount comprising a thermally insulating material that thermally insulates the motor from the pump body.

5 24. The material dispense pump of claim 23 wherein the thermally insulating material comprises Ultem™.

10 25. The material dispense pump of claim 22 wherein the cartridge comprises a material selected from the group consisting of aluminum, copper, aluminum alloy, copper alloy, and aluminum-copper alloy.

26. The material dispense pump of claim 22 wherein the cartridge comprises copper.

15 27. The material dispense pump of claim 22 further comprising an auger coupler that couples the motor axle to the auger screw, the auger coupler comprising thermally insulating material that thermally insulates the motor axle and auger screw.

20 28. The material dispense pump of claim 22 wherein the pump body heater comprises a heater and a temperature monitoring device and further comprising a pump body heater controller for controlling the temperature of the pump body in response to a signal received from the temperature monitoring device.

25 29. The material dispense pump of claim 28 wherein the pump body heater comprises a resistive heater and wherein the temperature monitoring device comprises a thermocouple.

30. The material dispense pump of claim 28 wherein the pump body heater controller, the pump body heater, and the temperature monitoring device are configured as a closed loop heat control system for controlling the temperature of the pump body.

5 31. The material dispense pump of claim 22 further comprising a pump body heater plate that abuts a surface of the pump body, the pump body heater plate comprising a thermally insulating material, wherein the pump body heater is seated at an outer surface the pump body heater plate to interface with the surface of the pump body.

10 32. The material dispense pump of claim 31 wherein the pump body heater plate further comprises a compression mechanism that urges the pump body heater toward physical contact with the surface of the pump body.

15 33. The material dispense pump of claim 30 further comprising a quick release mounting plate that mates with a latch plate for mounting the material dispense pump to a base, the quick release mounting plate being coupled to the pump body heater plate such that the quick release mounting plate is thermally insulated from the pump body.

20 34. The material dispense pump of claim 22 further comprising cartridge retention screws that retain the pump cartridge in the pump body, an outer surface of the cartridge retention screws comprising thermally insulating material.

25 35. The material dispense pump of claim 22 further comprising a dispense tip retention nut for mounting a dispense tip to the pump cartridge, an outer surface of the dispense tip retention nut comprising thermally insulating material.

36. The material dispense pump of claim 22 wherein the motor comprises a closed-loop servo motor having indexed rotational positions.
- 5 37. The material dispense pump of claim 22 further comprising a material reservoir heater for heating material contained in a material reservoir to be dispensed by the pump cartridge.
- 10 38. The material dispense pump of claim 37 wherein the material reservoir heater comprises a heater and a temperature monitoring device and further comprising a material reservoir heater controller for controlling the temperature of the material in response to a signal received from the temperature monitoring device.
- 15 39. The material dispense pump of claim 38 wherein the material reservoir heater comprises a resistive heater and wherein the temperature monitoring device comprises a thermocouple.
- 20 40. The material dispense pump of claim 37 further comprising a heat distribution body comprising heat conductive material in thermal communication with the material reservoir heater that houses the material reservoir and heats material contained in the reservoir.
- 25 41. The material dispense pump of claim 40 wherein the material reservoir comprises a material syringe, and wherein the heat distribution body is cylindrical in shape.
42. The material dispense pump of claim 40 further comprising a reservoir support mount for supporting the heat distribution body and the material reservoir and wherein the reservoir support mount is formed of thermally insulating material that thermally insulates the heat distribution body from the pump body.

43. The material dispense pump of claim 37 wherein the material reservoir heater controller, the material reservoir heater, and the temperature monitoring device are configured as a closed loop heat control system for controlling the temperature of the material reservoir.

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44. A method for controlling a material dispense pump comprising:
- controlling the temperature of a pump body, the pump body formed of thermally conductive material and having a pump cartridge formed of thermally conductive material, the pump cartridge having an auger screw driven by a motor for dispensing material, the pump cartridge being in thermal communication with the
- 10 pump body; and
- controlling the temperature of a material reservoir containing material to be dispensed by the pump cartridge, wherein controlling the temperature of the pump body and controlling the temperature of the material reservoir are independent.

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45. The method of claim 44 wherein controlling the temperature of the pump body comprises monitoring the temperature of the pump body, and applying heat to the pump body in response to monitored temperature.

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46. The method of claim 44 wherein controlling the temperature of the material reservoir comprises monitoring the temperature of the material reservoir, and applying heat to the material reservoir in response to monitored temperature.